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PCT

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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> :  C09J 5/06 // E04D 5/02, E04F 13/00, B29C 65/36		A1	(11) International Publication Number: WO 98/05725  (43) International Publication Date: 12 February 1998 (12.02.98)
(21) International Application Number: PCT/US97/13648  (22) International Filing Date: 5 August 1997 (05.08.97)		(81) Designated States: AU, BR, CA, JP, MX, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(30) Priority Data: 08/691,836 5 August 1996 (05.08.96) US		Published <i>With international search report.</i>	
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(74) Agent: LITZINGER, Jerrold, J.; 8485 Broadwell Road, Cincinnati, OH 45244 (US).			

(54) Title: METHOD OF ADHERING SHEET GOODS TO A WORK SURFACE

## (57) Abstract

A clean, neat and effective method for adhering sheet goods to a work surface entails placing adjacent to the surfaces to be joined a device which comprises: a target element contiguous with a heat activatable adhesive material, said target element being absorbent of electromagnetic waves which are convertible to heat energy to activate said adhesive material, holding said surfaces together, and exposing said device to electromagnetic waves to produce heat sufficient to activate the adhesive material to effect a bonded relationship between the sheet goods and the work surface.

**METHOD OF ADHERING SHEET GOODS  
TO A WORK SURFACE**

**CROSS REFERENCE TO A RELATED APPLICATION**

This application relates to U.S. Patent Application Serial No. filed on even date  
5 herewith and entitled "Adhesive Device" by Shomler et al. Said application and its  
disclosure are hereby incorporated by reference.

**BACKGROUND OF THE INVENTION**

**FIELD OF THE INVENTION**

This disclosure relates to the installation of sheet goods by adhesive attachment.  
10 "Sheet goods" is the term used in the construction industry to describe panels, plastic  
counter laminates, gypsum board drywall, plywood, oriented strand board (OSB), particle  
board, asphaltic shingles, insulation board and exterior siding panels. These sheet goods  
are generally employed to construct subfloors, roof sheathing, walls sheathing, sheer  
walls, roof and wall shingle, insulate walls and floor underlayment. On the job, sheet  
15 goods are attached to conventional structural framing material which is usually wood or  
steel. The sheeting is also frequently attached to itself and to steel framing members of  
various gauges and strengths. It is envisioned that the practice of the disclosed method  
would occur both at in-plant and construction sites.

Sheet goods are usually attached to a structural work surface which, as mentioned  
20 above, is usually a 2x or 4x material of wood, composite material or a steel framing  
member. It is also important to note that sheet goods may also be attached to another

piece of sheet goods which, in that case, would also be a work surface. The attachment of sheet goods to the work surface is typically effected by employing mechanical fastening devices such as nails, staples, tacks and brads. However, these power or hand driven fastening devices are labor intensive and are rapidly falling into disfavor as new  
5 adhesives are developed which are safer to work with and produce attachments that are actually more secure than the traditional fastening methods. However, the use of new adhesives alone is not the final answer. Adhesives are messy and difficult to apply to "hidden" or inaccessible places. It is apparent, then, that inventions are waiting to be made which address the placement of adhesive material in a neat, clean, safe and  
10 effective manner that can be used beneficially in manufacturing and construction, and especially with regard to the placement of sheet goods to a work surface.

Not surprisingly then, others have experimented with alternatives to traditional fastening devices for attaching sheet goods to a work surface.

#### DESCRIPTION OF THE PRIOR ART

15 United States Patent 4,038,120 to Russell describes the use of an energized heating element or wire to heat a hot melt glue resulting in adhesion between contiguously assembled panels. The reference method involves heating a glue-coated wire to liquefy the glue producing a cohesive state and facilitating the assembly of panels. This method is particularly useful for introducing a cohesive material (glue) to an area of  
20 limited accessibility (groove), but the heating element (wire) requires the direct application of energy (electricity) to provide the heat to melt glue.

United States Patent 3,574,031 to Heller et al. describes a method and material for

welding thermoplastic bodies by using a susceptor between the bodies to be joined. The susceptor sealant is characterized by having particles, heatable by induction, dielectric or radiant energy, dispersed in a thermoplastic carrier compatible with the thermoplastic sheets to be welded. The welding of the thermoplastic sheets is effected by exposing the  
5 susceptor sealant to heat energy, softening the carrier material and joining all thermoplastic materials.

United States Patent 3,996,402 to Sindt relates to the assembly of sheet materials by the use of a fastening device utilizing an apertured sheet of eddy current-conducting material sandwiched between coatings of hot-melt glue. An induction heating system is  
10 activated causing eddy current heating in the EC-conducting material with consequent melting of the hot-melt glue thus resulting in fusion and, ultimately, bonding of the sheet materials in accordance with the desired construction.

#### SUMMARY OF THE INVENTION

The presently disclosed method of adhering sheet goods to a work surface is distinguished from, and improves upon, the prior art by utilizing a device to be placed adjacent to the surfaces to be joined which comprises a target element contiguous with a heat activatable adhesive material said target element being absorbent of electromagnetic waves which are convertible to heat energy for activating the adhesive material, holding said surfaces together, and exposing said device to electromagnetic waves to produce heat sufficient to activate the adhesive material to effect an adhesive bond between the sheet goods and the work surface.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Sheet goods comprising, for example, gypsum board drywall, plywood, insulation board, plastic or metal laminates, oriented strand board, particle board, asphaltic shingles and exterior siding panels can be adhesively joined effectively and efficiently to a work surface such as a joist, stud, plate, header, truss or rafter typically fashioned from a 2x or 5 4x wood, steel or composite material by employing the method herein described.

A typical procedure for the attachment of sheet goods to a work surface would entail little more than placing the devices disclosed herein in such a manner that when activated they would adhesively join a piece of sheet goods material to the intended work 10 surface.

At the risk of stating the obvious by describing the ease of performing the disclosed method, consider the simplicity of installing a subflooring or a roof sheathing using four feet by eight feet plywood panels. The method entails little more than simply placing, or perhaps securing, units of the disclosed device on the edge surfaces of the 15 rafters, wall studs or floor joists where the plywood panel is to be attached, putting the panel in place and then activating the adhesive device with electromagnetic waves to adhesively join the panel to its work surface.

In the case of asphaltic shingles, the roof and wall sheeting materials would, in turn, be the work surface for the next layer of sheeting material, viz., the asphaltic 20 shingle. Shingles are particularly well suited for installation according to the disclosed method. Shingles are widely used as roof coverings and frequently for siding as well. Shingles are applied in overlapping courses or rows, and the degree of overlapping is

determined by the pitch of the roof or aesthetic concerns. In either case, one shingle will be the work or attaching surface of the overlapping shingle. In these cases, almost the entire construction of the dwelling or edifice would be effected by adhering one sheeting material to another and to a third layer, all using the adhesive device of the disclosed  
5 method.

Looking at the adhesive device employed in the disclosed method in greater detail, we see that the target element must, for the most part, be fashioned from materials or substances that are not transparent to electromagnetic waves. Indeed, the target element will necessarily be constructed of a composition that will absorb electromagnetic  
10 waves. Once absorbed by the target element, these waves will produce magnetic hysteresis and eddy currents resulting in heat energy which will melt or activate the contiguous adhesive material.

Typically, the target element will be fashioned from metallic materials such as steel, aluminum, copper, nickel or amalgams thereof which have proven utility and are  
15 readily available; although, some semi-metallic materials such as carbon and silicon are also known to be suitable for the absorption of electromagnetic waves.

The target element can assume any form or shape consistent with the overall configuration of the adhesive device. Frequently, the target element will be presented as a metallic foil, mesh or strip, and, in some instances, it will be more effective to present  
20 the target element in the form of a fiber, chip or flake of an electromagnetic absorbable material. The point to be made is that the target element need only be fashioned from a material reasonably impervious to, and absorptive of, electromagnetic waves.

In use, the adhesive device needs to be situated adjacent to the sheet goods and the work surface. Typically, the sheet goods will be wood, fiber board, insulation board, plastic or any of a variety of composite materials. As a practical matter, of course, the sheet goods need to be transparent to electromagnetic waves. Some materials will be  
5 more transparent than others, and empirical adjustments can and will be made to modulate the quantity and intensity of electromagnetic wave energy needed to optimally activate the adhesive material.

In many instances, it will be sufficient for the adhesive device simply to be placed adjacent to the sheet goods and the work surface. In other construction or  
10 assembly situations, it will be necessary to make some arrangements or take additional steps to make sure the adhesive device remains in place prior to activation. Such an additional step need be little more than introducing an additional attachment element such as a small pressure sensitive adhesive area on the surface of the device. Simpler means for positioning the device prior to activation might entail clamping, tacking, stapling or  
15 spiking to make sure the adhesive device is situated and activated in the most effective and, therefore, most desirable location. But these measures, of course, would be optional procedures and in no way essential to the performance of the device in its broadest typical and routine applications

When desirably situated adjacent to the sheeting materials and the work surface,  
20 the adhesive device is ready to be exposed to electromagnetic waves, produced by and emanating from a generator powered by a source of alternating electric current. The generator can be held in a fixed position for assembly-line production or designed to be

manipulated so as to quickly and easily pass over, around or near the strategically manipulated so as to quickly and easily pass over, around or near the strategically  
“hidden” device while emitting electromagnetic waves which will penetrate the  
“transparent” sheet goods, be absorbed by the target element, be converted to heat energy,  
activate the adhesive material resulting in a bonded relationship between the sheet goods  
5 and the work surface.

To elaborate, somewhat, heat is produced in the conductive target element by two mechanisms: eddy current resistive heating and magnetic hysteresis. Eddy current resistive heating applies to all conductive materials and is produced in the target element by the electromagnetic waves emanating from the generator. The heat resulting from 10 magnetic hysteresis is observed only in magnetic materials. As the electromagnetic field produced by the generator reverses polarity, the magnetized atoms or molecules in the target element also reverse. There is an energy loss in this reversal which is analogous to friction: This energy loss is magnetic hysteresis. The “lost” energy is quickly converted to heat and conducted by the target material to the contiguous, and frequently enveloping, 15 heat-activatable adhesive material to initiate adhesion.

When heated to the necessary temperature, the adhesive material will liquefy or become heat-activated, attach itself to the work surface and, on cooling, create an adhesive relationship between the sheet goods and the work surface.

Two adhesion mechanisms, hot-melt and heat-activated cure, are proposed for use 20 with the disclosed device. Both mechanisms are initiated by heat emanating from the target element. Hot-melt adhesives are solid at ambient temperatures, but melt or liquefy when the temperature is elevated by, for instance, heat accumulating in the target

element. The melted adhesive "wets" the adherends and, in the case of porous or fibrous adherends, penetrates the surface of the pieces to be bonded. As the adhesive cools, the adherends and adhesive are bonded by the electrostatic attraction of polar molecular groups. In the case of porous or fibrous adherends, mechanical interlocking can contribute to bond strength. Note that for the hot-melt mechanism, the bonding is reversible. Thus by repeating the induction heating procedure, the bond can be undone and the adherends separated. The ability to reverse the adhesion and separate fixed millwork is not a trivial attribute. In addition to the obvious advantage of being able to reassemble or repair misaligned sheet goods, it may also desirable to be able to disassemble affixed sheeting material to facilitate serviceability and repair.

Heat-activated curing adhesives are also solid and easy to manipulate at ambient temperatures, but when the adhesive temperature is elevated by, for example, the heat emanating from the target element, a chemical reaction is initiated. This reaction involves a cure or crosslinked bonding either within the adhesive or between the adherends. Such bonds are typically irreversible. Frequently, a heat-activated curing adhesive bond will demonstrate an electrostatic attraction between the adhesive and the adherends and a crosslinked bond within itself.

While the foregoing is a complete description of the disclosed method, numerous variations and modifications may also be employed to implement the purpose of the invention. And, therefore, the elaboration provided should not be assumed to limit the scope of the invention which is intended to be defined by the appended claims.

What is claimed is:

1. A method of adhering sheet goods to a work surface which comprises placing adjacent to the surfaces to be joined a device which comprises: a target element contiguous with a heat activatable adhesive material, said target material being absorbent of electromagnetic waves which are convertible to heat energy to activate said adhesive material, holding said surfaces together, and exposing said device to electromagnetic waves to produce heat sufficient to activate the adhesive material to effect a bonded relationship between the sheet goods and a work surface.
2. An article of sheet goods including an adhesive device which comprises: a target element contiguous with a heat activatable adhesive material, said target material being absorbent of electromagnetic waves which are convertible to heat energy to activate said adhesive material.

# INTERNATIONAL SEARCH REPORT

Int'l Application No  
PCT/US 97/13648

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 C09J5/06 //E04D5/02, E04F13/00, B29C65/36

According to International Patent Classification(IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 C09J B29C B27H E04F E04D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AT 321 432 A (H.LEINFELLNER) 25 March 1975 see the whole document ---	1,2
X	PATENT ABSTRACTS OF JAPAN vol. 012, no. 372 (C-533), 5 October 1988 & JP 63 120786 A (MICHIE MIYAMOTO), 25 May 1988, see abstract; figures ---	1,2
X	US 3 996 402 A (SINDT MELVIN R) 7 December 1976 cited in the application see column 2, line 33 - line 36; figure 11 ---	1,2 -/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "Z" document member of the same patent family

1

Date of the actual completion of the international search

24 November 1997

Date of mailing of the international search report

28/11/1997

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Authorized officer

Cordenier, J

## INTERNATIONAL SEARCH REPORT

Inte Onal Application No  
PCT/US 97/13648

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 013, no. 095 (C-573), 6 March 1989 & JP 63 273682 A (MICHIE MIYAMOTO), 10 November 1988, see abstract; figures ---	1.2
X	PATENT ABSTRACTS OF JAPAN vol. 096, no. 007, 31 July 1996 & JP 08 074390 A (YAMADE:KK), 19 March 1996, see abstract ---	1.2
X	WO 93 09310 A (NAVJORD BJOERN ;OEKVIST GUNNAR (SE)) 13 May 1993 see abstract; figures ---	1.2
X	EP 0 027 306 A (US HEALTH) 22 April 1981 see the whole document ---	1.2
X	US 4 878 978 A (GOEL ANIL B ET AL) 7 November 1989 see column 4, line 11 - line 18 ---	1.2
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 328 (M-1281), 16 July 1992 & JP 04 093455 A (KIKUSUI KAGAKU KOGYO KK), 26 March 1992, see abstract; figures -----	1.2

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No	
PCT/US 97/13648	

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
AT 321432 A	25-03-75	NONE	
US 3996402 A	07-12-76	US 4120712 A	17-10-78
WO 9309310 A	13-05-93	SE 9103250 A	06-05-93
EP 0027306 A	22-04-81	AU 534904 B AU 6167680 A CA 1165405 A JP 1477974 C JP 56035390 A JP 63022036 B US 4521659 A	23-02-84 05-03-81 10-04-84 27-01-89 08-04-81 10-05-88 04-06-85
US 4878978 A	07-11-89	US 4762864 A EP 0249940 A JP 63010683 A	09-08-88 23-12-87 18-01-88



JP6001955

Biblio

Page 1

Drawing

## ADHESIVE SHEET AND BONDING METHOD USING THE SAME

Patent Number: JP6001955

Publication date: 1994-01-11

Inventor(s): YAMAMOTO HIROSHI; others: 02

Applicant(s): NITTO DENKO CORP

Requested Patent:  JP6001955

Application Number: JP19920183022 19920617

Priority Number(s):

IPC Classification: C09J7/00; C09J5/06; C09J7/02

EC Classification:

Equivalents:

### Abstract

PURPOSE: To provide an adhesive sheet and the subject bonding method capable of adhesive treatment in a short time of an adherend consisting of nonmagnetic material and also of such treatment of a coarse-surfaced adherend in high reliability.

CONSTITUTION: The objective adhesive sheet can be obtained by partly or wholly laminating (A) a base sheet 2 consisting of a high-frequency heating-type adhesive composed of a thermoplastic and/or thermosetting resin(s) and ferromagnetic material with (B) pressure-sensitive adhesive layer(s) 1. The another objective bonding method is such that an adherend consisting of nonmagnetic material is temporarily set through the above adhesive sheet followed by heating the base sheet by applying high frequency. With this method, the adherend can be put to adhesive treatment while being temporarily set, thereby simplifying the operation without contact with the adherend, thus leading to no damage to its surface. Also, for example, the countermeasure against disasters involving organic solvents can be dispersed with.

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\*の天然ゴム系感圧接着剤を厚さ300μmのシートに成形し、それをステンレス製ネット（開口数250個/inch<sup>2</sup>）の両面にプレス接着して接着シートを形成し、それを用いて比較例1に準じ、接合体を得た。

## 【0024】比較例3

酢酸ビニル含有率が20重量%のエチレン・酢酸ビニル共重合体のトルエン溶液を厚さ500μmで塗布し、その層を介して直ちに厚さ10mmの石膏ボードと厚さ5mmの木材を接着して接合体とした。

## 【0025】比較例4

6

\*酢酸ビニル含有率が15重量%のエチレン・酢酸ビニル共重合体のトルエン溶液を厚さ500μmで塗布し、その層を介して直ちに厚さ10mmの石膏ボードと厚さ5mmの木材を接着して接合体とした。

## 【0026】評価試験

実施例、比較例で得た接合体を5分間放置後、その引張り剪断接着力を測定した（接着面積25mm×25mm、引張り速度50mm/分、20℃）。前記の結果を表1に示した。

\*10 【表1】

	引張り剪断接着力(kg/cm <sup>2</sup> )
実施例1	25.0
実施例2	22.0
比較例1	5.0
比較例2	5.5
比較例3	約0
比較例4	約0

## 【図面の簡単な説明】

## 【図1】実施例の断面図

## 【図2】他の実施例の断面図

## 【符号の説明】

1：感圧接着層

2：ベースシート

21：強磁性体の粉末

22：樹脂層

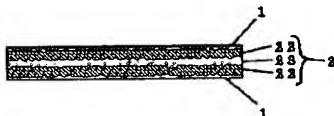
23：強磁性体からなる支持体

30

【図1】



【図2】



XP-002189990

AN - 1994-045601 [06]

A - [001] 017 034 04- 040 041 046 047 066 067 07- 074 076 081 083 09& 09-  
10& 10- 117 122 141 143 15- 150 17& 17- 18& 18- 19& 27& 342 387 393  
428 431 443 446 477 479 481 502 575 596 609 613 618 623 626 688 725  
- [002] 017 04- 040 041 046 047 062 063 07- 09& 09- 10& 10- 15- 17& 17-  
18& 18- 19& 231 241 342 387 393 428 431 443 446 477 479 481 502 575  
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- [003] 017 04- 35& 387 428 431 443 446 575 596 609 613 618 623 626  
- [004] 017 038 04- 040 07- 09& 09- 10& 10- 139 140 15- 17& 17- 18& 18-  
185 189 19& 226 231 342 37& 387 393 428 431 443 446 473 477 479 481  
502 575 596 609 613 618 623 626 725

AP - JP19920183022 19920617

CPY - NITL

DC - A18 A28 A81 G03

FS - CPI

IC - C09J5/06 ; C09J7/02

KS - 0004 0105 0108 0111 0114 0117 0120 0123 0126 0129 0207 0209 0218 0231  
0234 0239 0241 0495 0544 0789 1093 1276 1277 1282 1283 1288 1294 1737  
2003 2020 2319 2371 2413 2426 2433 2437 2488 2522 2524 2541 2542 2654  
2682 2683 2685 2691 2698 2718 2734 3020 3155 3158

MC - A08-M09A A11-C01 A12-R07 G03-B01 G03-B02 G03-B03 G03-B04

PA - (NITL ) NITTO DENKO CORP

PN - JP6001955 A 19940111 DW199406 C09J7/00 004pp

PR - JP19920183022 19920617

XA - C1994-020615

XIC - C09J-005/06 ; C09J-007/02

AB - J06001955 The sheet (PSAS) has partly or wholly coated pressure sensitive adhesive (A) layers on both surfaces of a base sheet (B) made from high frequency heating type adhesive (B1) consisting of thermoplastic resin (B1a) and/or thermosetting resin (B1b) and ferromagnetic material (B1c).

- Also claimed is a method for adhesion comprising: (I) tentatively adhering a non-magnetic adherend by means of the (B1) layer of the above-mentioned (PSAS); and (II) heating (B) by radiation of high frequency.

- (B) has a thickness below 3 mm, pref. 5 micron to 1.5 mm. Examples of (B1a) are EVA, EEA, ethylene/alpha-olefin copolymers, chlorinated polyethylene, polybutadiene, polyamides, polyesters and polyurethanes. Examples of (B1b) are epoxy, phenol and melamine resins. Examples of (B1c) are powders, fibres, foils and hollow particles of metals and alloys and ferrites. A suitable ((B1a)+(B1b))/(B1c) wt. ratio is 100/3-50. (A) may be any pressure sensitive adhesive and is coated by a thickness b low 500 micron. A high frequency wave generator of 10xpower2-10xpower5 KHz and 0.1-200 kW can b used for application of (PSAS).

- USE/ADVANTAGE - Suitable for adhering non-magnetic adherends like construction materials such as ceiling boards and decorative wall boards, even if they have rough surfaces, within a short time.(Dwg.0/2)

IW - PRESSURE SENSITIVE ADHESIVE SHEET CEILING BOARD WALL BOARD COMPOSE  
ADHESIVE CONTAIN THERMOPLASTIC THERMOSETTING RESIN FERROMAGNETIC  
MATERIAL BASE SHEET

**IKW - PRESSURE SENSITIVE ADHESIVE SHEET CEILING BOARD WALL BOARD COMPOSE  
ADHESIVE CONTAIN THERMOPLASTIC THERMOSETTING RESIN FERROMAGNETIC  
MATERIAL BASE SHEET**

NC - 001

OPD - 1992-06-17

ORD - 1994-01-11

PAW - (NITL ) NITTO DENKO CORP

TI - Pressure sensitive adhesive sheet for e.g. ceiling boards, wall  
boards, etc - composed of adhesive contg thermoplastic and/or  
thermosetting resins and ferromagnetic material on base sheet

A01 - [001] H0022 H0011 ; R00326 G0044 G0033 G0022 D01 D02 D12 D10 D51 D53  
D58 D82 ; G0033-R G0022 D01 D02 D51 D53 ; H0317 ; S9999 S1581 ;  
P1150 ;

- [002] H0022 H0011 ; R00326 G0044 G0033 G0022 D01 D02 D12 D10 D51 D53  
D58 D82 ; R01126 G0340 G0339 G0260 G0022 D01 D11 D10 D12 D51 D53 D58  
D63 D85 F41 ; H0317 ; S9999 S1581 ; P1150 ; P0088 ; P0180 ;

- [003] H0022 H0011 ; R00326 G0044 G0033 G0022 D01 D02 D12 D10 D51 D53  
D58 D82 ; R00835 G0566 G0022 D01 D11 D10 D12 D51 D53 D58 D63 D84 F41 ;  
H0317 ; S9999 S1581 ; P1150 ; P1310 ;

- [004] R00806 G0828 G0817 D01 D02 D12 D10 D51 D54 D56 D58 D84 ; H0000 ;  
H0317 ; S9999 S1581 ; P0328 ; P0339 ;

- [005] H0317 ; S9999 S1581 ; P0839-R F41 ; P0635-R F70 ; P1592-R  
F77 ;

- [006] ND01 ; Q9999 Q6893 Q6826 ; Q9999 Q6826-R ; Q9999 Q6995-R ;  
N9999 N5721-R ; N9999 N6177-R ; K9574 K9483 ; K9698 K9676 ; B9999  
B5243-R B4740 ;

- [007] N9999 N7147 N7034 N7023 ; B9999 B5447 B5414 B5403 B5276 ;  
Q9999 Q6644-R ; K9745-R ;

- [008] Gm D00 F20 Fe 8B Tr ; A999 A748 ; S9999 S1514 S1456 ; S9999  
S1070-R ; S9999 S1456-R ;

A02 - [001] R00326 G0044 G0033 G0022 D01 D02 D12 D10 D51 D53 D58 D82 ;  
H0000 ; M9999 M2244 M2222 ; H0317 ; S9999 S1581 ; P1150 ; P1161  
; P1229 ;

- [002] ND01 ; Q9999 Q6893 Q6826 ; Q9999 Q6826-R ; Q9999 Q6995-R ;  
N9999 N5721-R ; N9999 N6177-R ; K9574 K9483 ; K9698 K9676 ; B9999  
B5243-R B4740 ;

- [003] N9999 N7147 N7034 N7023 ; B9999 B5447 B5414 B5403 B5276 ;  
Q9999 Q6644-R ; K9745-R ;

- [004] CI 7A ; H0157 ;

- [005] Gm D00 F20 Fe 8B Tr ; A999 A748 ; S9999 S1514 S1456 ; S9999  
S1070-R ; S9999 S1456-R ;

A03 - [001] P0000 ;

- [002] ND01 ; Q9999 Q6893 Q6826 ; Q9999 Q6826-R ; Q9999 Q6995-R ;  
N9999 N5721-R ; N9999 N6177-R ; K9574 K9483 ; K9698 K9676 ; B9999  
B5243-R B4740 ;

- [003] Q9999 Q6677 Q6644 ; N9999 N7090 N7034 N7023 ; K9712 K9676 ;

A04 - [001] H0328 ; P0464-R ; P0226 P0282-R ; S9999 S1581 ;

- [002] R00859 G1809 G1649 D01 D23 D22 D31 D45 D50 D83 F19 F10 F07 ;  
H0011-R ; P0259-R P0226 ; H0328 ; S9999 S1581 ;

- [003] ND01 ; Q9999 Q6893 Q6826 ; Q9999 Q6826-R ; Q9999 Q6995-R ;  
N9999 N5721-R ; N9999 N6177-R ; K9574 K9483 ; K9698 K9676 ; B9999  
B5243-R B4740 ;

- [004] Q9999 Q6688 Q6644 ; N9999 N7147 N7034 N7023 ; B9999 B5447  
B5414 B5403 B5276 ; K9745-R ;
- [005] Gm D00 F20 Fe 8B Tr ; A999 A748 ; S9999 S1514 S1456 ; S9999  
S1070-R ; S9999 S1456-R ;